Spreading the heat

A new copper/carbon-nanotube composite - with potentially a lower cost and greater thermal conductivity than diamond composites as well as excellent thermal-expansion properties - could attract electronics designers everywhere.

MDA SBIR funding has allowed Omega Piezo Technologies, Inc. (State College, PA) to develop the nanocomposite to manage heat in high-power MDA radar systems. The company believes the material can be used in heat spreaders for computers and other heat-generating electronic devices.

While diamond has shown great potential in materials for heat spreaders, and at least two companies have introduced diamond-copper composite products diamond composites are relatively expensive and difficult to machine. The copper/carbon-nanotube material Omega Piezo is developing has the potential for even greater thermal conductivity.

Researchers are reportedly on track to develop a material with the thermal conductivity of 1300W/mK compared with 600W/mK to 1200W/mK of the diamond-copper composites. The higher the thermal conductivity, the more quickly a device can spread heat and using carbon nanotubes instead of diamond, the Omega Piezo material should offer a more cost-efficient alternative. The company expects to produce a prototype material that meets its planned specifications, with full-scale production likely to follow within a year.

The nanocomposite may also offer benefits over materials such as copper molybdenum, relatively inexpensive but with a thermal conductivity of only about 200W/mK. Omega Piezo's material would cost more than copper molybdenum, but the benefit of much greater thermal conductivity should make the nanocomposite more attractive, as long as the price is no more than two or three times that of copper molybdenum.

Electro-opto polymer patent

Lumera Corporation has received the third in a series of patents covering the company's fundamental technology which protects the electro-optic materials and devices that Lumera is developing and bringing to market.

Electro-optic polymers have fundamental advantages over current materials used to fabricate components for optical communication. These advantages offer significantly higher bandwidths and improved power efficiency combined with simplified, low cost fabrication.

Practical lifetime of electro-optic polymers however is a critical issue actively researched for many years.

Lumera's patented technology uses molecular-level material modification to provide improvements in both lifetime and efficiency.

"In the past, other approaches to increase the lifetime of electro-optic polymers also reduced their efficiency," explains Tom Mino, Lumera's CEO.

"But we've found that, with our proprietary modifications, we can increase both the lifetime and the efficiency."

Lumera currently has three issued and four allowed patents and over 30 patent applications pending that address markets such as fiber optic communications, biotechnology, and wireless communications. The most recently issued patent number is 6,822,384, which joins the related 6,750,603 & 6,716,995.

"We have been aggressively protecting the IP around our competency in several areas including electro-optic polymers and devices, biotechnology instruments and disposables, and smart antennas for wireless communication," says Mino.

"Government agencies have been interested in this technology from our inception, and we continue to derive revenue for those efforts; but now we are seeing strong interest from companies in the optical modulator market and biotechnology sector as well."

Transparent & flexible OLET and substrate

An industry-academia alliance initiated by Kyoto University, Pioneer, Mitsubishi Chemical, and Rohm has developed two flexible display components: an organic light emitting transistor (OLET) and a flexible transparent substrate with a low thermal expansion coefficient.

The OLET has an electroluminescence (EL) light emitting function built into an organic transistor.

An active-matrix display, comprised of the OLETs, requires a substantially fewer components than conventional organic EL displays, since it has both driver transistors and light emitting devices embedded.

The latest OLET has a gate voltage control capability to control the amount of EL emission, just as conventional OLETs control drain current by gate voltage.

The substrate, Bionano Fiber Composite, uses a transparent nano fiber less than 100nm in diameter for a filler to achieve a parallel light transmittance of more than 85%.

It also has about 1/30 the thermal expansion coefficient of silicon crystal, equivalent to that of quartz glass, and yet has a coefficient of elasticity higher than glass and about the same as aramid fiber.

The alliance will work on the commercialisation of the devices,for applications including mobile device displays, e-books, and e- posters.